Climate gateway

DKAC-D / DKAC-D / MBAC-I /
MDAC-K / PNAC-K / LGAC-D

v1.0

# Programming manual

ingenium

www.besknx.com

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# 1 General description

DKAC-K, DKAC-D, MBAC-K, MDAC-K, PNAC-K devices are climate gateways that control machines of Daikin, Mitsubishi, Midea and Panasonic, according to the reference, so that the user can integrate the control of the temperature, operating modes, speeds of their fan and which, typically, would be made from the remote control of the unit from weather and ventilation, into KNX system.

These references are configured with the same Bes application program.

For the communication cable which connects the gateway with the machine, it is recommended a maximum length of 1 meter.

| | DKAC-K | DKAC-D | MBAC-K | MDAC-K | PNAC-K |
|---|---|---|---|---|---|
| Ambient temperatura (if the machine has temperature sensor) | Yes | No | Yes | Yes | Yes |
| Slave mode | Yes | No | No | Yes (it works with remote controller without slave mode) | No |

# 2 Technical information

| | |
|---|---|
| KNX power supply | 29 Vdc of the KNX bus |
| KNX power consumption | 20 mA of the KNX bus |
| Mounting / size | DIN rail / 2 modules |
| Connections | Connection terminal to KNX bus and terminals for machine connection |
| Operating modes | Heating, cooling (summer / winter), dehumidification, ventilation, or automatic |
| Ambient temperature ranges | Operation: - 10 ° C / 55 ° C<br>Storage: - 30 ° C / 60 ° C<br>Transport: - 30 ° C / 60 ° C |
| Regulation | According to the guidelines on electromagnetic compatibility and low voltage: EN 50090-2-2 / EN 61000-6-3:2007 / UNE-EN 61000-6-1:2007 / UNE-EN 61010-1. |

# 3 Programming

## 3.1 Application program information

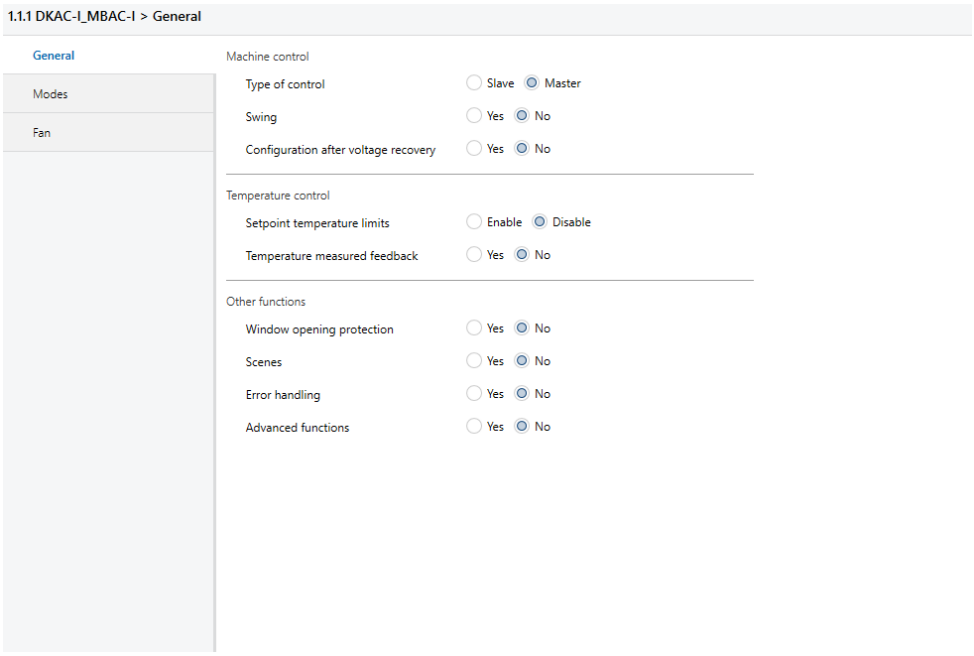
Manufacturer: Bes-Ingenium

Application: DKAC-I_MBAC-I

Maximum number of objects of communication: 255

Version: 1.0

The devices are programmed from a window parameters.




## 3.2 Table of objects of communication

| Number | Name | Function of the object | Length | C | R | W | T | U | Type of data |
|---|---|---|---|---|---|---|---|---|---|
| 0 | On/off | Turn on/off the machine | 1 bit | C | - | W | - | U | switch |
| 1 | On/off | Turn on/off the machine status | 1 bit | C | R | - | T | - | switch |
| 2 | Setpoint | Setpoint temperature sent | 2 bytes | C | R | W | T | U | temperature (°C) |
| 3 | Setpoint | Setpoint temperature sent status | 2 bytes | C | R | - | T | - | temperature (°C) |
| 4 | Mode | Mode: 0=Auto; 1=Heat; 3=Cool; 9=Fan; 14=Dry | 1 byte | C | - | W | - | U | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | Mode | Mode status: 0=Auto; 1=Heat; 3=Cool; 9=Fan; 14=Dry | 1 byte | C | R | - | T | - | |
| 6 | Fan | Fan: 0-50%=Low; 51-100%=High | 1 byte | C | - | W | - | U | percentage (0..100%) |
| 7 | Fan | Fan status: 0-50%=Low; 51-100%=High | 1 byte | C | R | - | T | - | percentage (0..100%) |
| 8 | Temperature | Temperature: Received from machine | 2 bytes | C | R | - | T | - | temperature (°C) |
| 10 | Window | Open window: 0=Close; 1=Open | 1 bit | C | - | W | - | U | |
| 12 | Swing | Swing: 0=Fixed position; 1=Motion | 1 bit | C | - | W | - | U | switch |
| 13 | Swing | Swing status: 0=Fixed position; 1=Motion | 1 bit | C | R | - | T | - | switch |
| 14 | Swing | Swing: 0-80%= Fixed position; 100%=Motion | 1 byte | C | - | W | - | U | percentage (0..100%) |
| 15 | Swing | Swing status: 0-80%=Fixed position; 100%=Motion | 1 byte | C | R | - | T | - | percentage (0..100%) |
| 16 | Internal ERROR | Internal ERROR: 0=No error;1=Error | 1 bit | C | R | - | T | - | boolean |
| 18 | External ERROR | External ERROR: 0=No error; 1=Error | 1 bit | C | R | - | T | - | boolean |
| 19 | External ERROR | External ERROR: Type | 1 byte | C | R | - | T | - | ratio (0..255) |
| 102 | Scenes | Scenes | 1 byte | C | - | W | - | U | scene control |
| 103 | Mode | Mode: 0=Cool; 1=Heat | 1 bit | C | - | W | - | U | switch |
| 104 | Mode | Mode status: 0=Cool; 1=Heat | 1 bit | C | R | - | T | - | switch |
| 105 | Fan | Fan: 0-33%=Min; 34-67%=Med; >68%=High | 1 byte | C | - | W | - | U | percentage (0..100%) |
| 106 | Fan | Fan status: 0-33%=Min; 34-67%=Med; >68%=High | 1 byte | C | R | - | T | - | percentage (0..100%) |
| 21 | Mode | Cool: 1=Set mode; 0=No effect | 1 bit | C | - | W | - | U | switch |
| 22 | Mode | Heat: 1=Set mode; 0=No effect | 1 bit | C | - | W | - | U | switch |
| 23 | Mode | Fan: 1=Set mode; 0=No effect | 1 bit | C | - | W | - | U | switch |
| 24 | Mode | Dry: 1=Set mode; 0=No effect | 1 bit | C | - | W | - | U | switch |
| 25 | Mode | Auto status: 1=Set; 0=Not set | 1 bit | C | R | - | T | - | enable |
| 26 | Mode | Cool status: 1=Set; 0=Not set | 1 bit | C | R | - | T | - | enable |
| 27 | Mode | Heat status: 1=Set; 0=Not set | 1 bit | C | R | - | T | - | enable |
| 28 | Mode | Fan status: 1=Set; 0=Not set | 1 bit | C | R | - | T | - | enable |
| 29 | Mode | Dry status: 1=Set; 0=Not set | 1 bit | C | R | - | T | - | enable |

| | | | | |
|---|---|---|---|---|
| 107 | Fan | Fan: 1=Up; 0=Down | 1 bit | C - W - U |

## 3.3 Description of communication objects

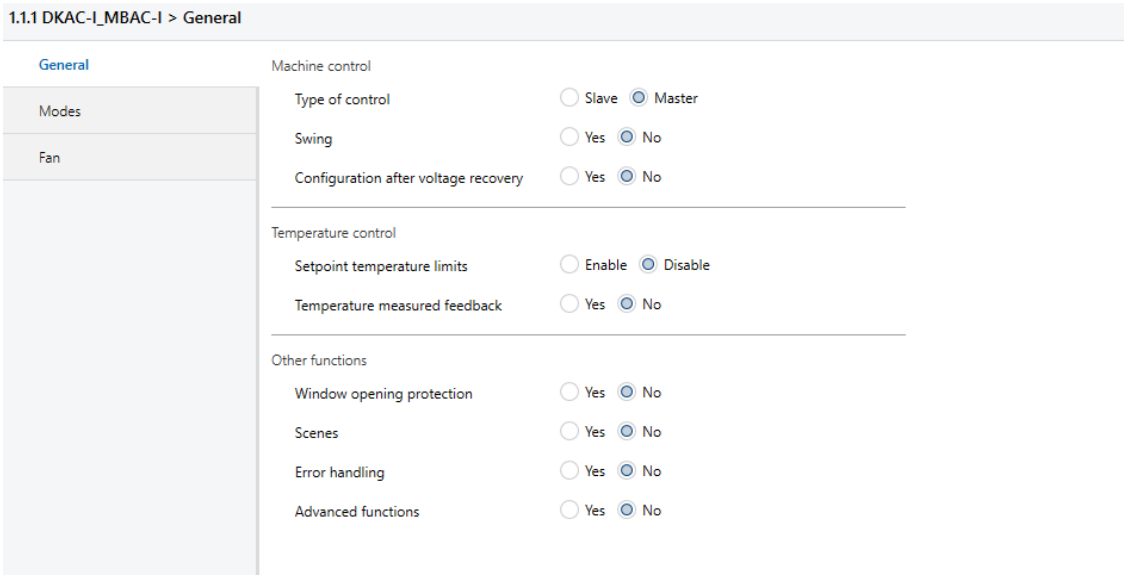
| Object | Object 0: On/Off - Turn on/off the machine |
|---|---|
| Function | 1 bit communication object to turn on or turn off the machine |
| Description | Climate machine turns on writing a '1' through this object of communication and off with a '0' |
| **Object** | **Object 1: On/Off - Turn on/off the machine status** |
| Function | 1 bit communication object to know the status of the machine |
| Description | By reading on this communication object, it is possible to know the on/off status of the climate machine |
| **Object** | **Object 2: Setpoint – Setpoint temperature sent** |
| Function | 2 bytes communication object to write a new temperature setpoint value. |
| Description | This communication object allows to set a new temperature setpoint for the machine. |
| **Object** | **Object 3: Setpoint – Setpoint temperature sent status** |
| Function | 2 bytes communication object to know or notify the setpoint temperature value. |
| Description | This communication object allows to notify to KNX bus or know by reading the current setpoint temperature. |
| **Object** | **Object 4: Mode - Mode: 0=Auto; 1=Heat; 3=Cool; 9=Fan; 14=Dry** |
| Function | 1 byte communication object to change the operating mode of the climate machine |
| Description | By this communication object it is posible to set the operating mode of the climate machine. This object is visible just in case the parameter which allows to dispose only heat/cooling modes is disabled. |
| **Object** | **Object 5: Mode - Mode status: 0=Auto; 1=Heat; 3=Cool; 9=Fan; 14=Dry** |
| Function | 1 byte communication object to read or notify the operating mode of the climate machine |
| Description | By this communication object it is possible to know via notifications or reading the operating mode of the climate machine. This object is visible just in case the parameter which allows to dispose only heat/cooling modes is disabled. |
| **Object** | **Object 6: Fan - Fan: 0-50%=Low; 51-100%=High** |
| Function | 1 byte communication object to change the fan speed of the climate machine |
| Description | By this communication object it is possible to change the fan speed. This object is visible just in case user selects two speeds for the machine. |
| **Object** | **Object 7: Fan - Fan status: 0-50%=Low; 51-100%=High** |
| Function | 1 byte communication object to read the fan speed of the climate machine |
| Description | By this communication object it is possible to know via notifications or reading the fan speed of the climate machine. This object is visible just in case user selects two speeds for the machine. |
| **Object** | **Object 8: Temperature – Temperature: Received from machine** |
| Function | 2 bytes communication object to read or notify the ambient temperature measured by the climate machine (The reference GW630200 does not receive the temperature from the machine) |
| Description | By this object ambient temperature measured by the machined is read or notified. |

| Object | Object 10: Window - Open window: 0=Close; 1=Open |
|---|---|
| Function | 1 bit communication object for the activation of open window protection. |
| Description | If a '1' is received through this communication object, for example, a magnetic sensor indicating the opening of a window, the device will give the order to turn off the climate machine allowing energy savings. When receiving a '0' through this same communication object, the machine will return to the state it was previously in case of selecting this option in the parameter set for that purpose.<br>This communication object will only be available if the option open window protection in the parameters tab is enabled. |
| **Object** | **Object 12: Swing – Swing: 0=Fixed position; 1=Motion** |
| Function | 1 bit communication object to establish the movement of the slats |
| Description | By writing a '1' through this communication object, the movement of the slats will be free while it is set fixed with a value of '0'. |
| **Object** | **Object 13: Swing - Swing status: 0=Fixed position; 1=Motion** |
| Function | 1 bit communication object to read the movement of the slats |
| Description | Through this communication object it is possible to read or notify the current movement of the slats |
| **Object** | **Object 14: Swing – Swing: 0-80%= Fixed position; 100%=Motion** |
| Function | 1 byte communication object to establish the opening of the slats. |
| Description | Writing through this communication object, the position or movement of the slats is established. |
| **Object** | **Object 15: Swing - Swing status: 0-80%=Fixed position; 100%=Motion** |
| Function | 1-byte communication object for the reading or notification of the opening of the slats |
| Description | Through this communication object it is possible to read or notify the percentage of opening or movement of the slats of the climate machine |
| **Object** | **Object 16: Internal ERROR – Internal ERROR: 0=No error; 1=Error** |
| Function | 1 bit communication object to read or notify an internal error of the machine |
| Description | Through this communication object it is read or notified if an internal error of the climate machine is received |
| **Object** | **Object 18: External ERROR – External ERROR: 0=No error; 1=Error** |
| Function | 1 bit communication object to read or notify an external error of the machine |
| Description | Through this communication object it is read or notified if an external error of the climate machine is received |
| **Object** | **Object 19: External ERROR – External ERROR: Type** |
| Function | 1 byte communication object to notify the type of the external error received from the machine |
| Description | Through this communication object it is notified the type of the external error received from the machine |
| **Object** | **Object 102: Scenes – Scenes** |
| Function | 1 byte communication object for the execution or recording of scenes |
| Description | Through this communication object it is possible to execute or record scenes |
| **Object** | **Object 103: Mode – Mode: 0=Cool; 1=Heat** |
| Function | 1 bit communication object to select the mode of the machine between cooling and heating. |

| | |
|---|---|
| Description | By means of this communication object, the operating mode of the climate machine is chosen between the cooling and heating modes. This communication object will only be available in the case that two unique modes are chosen in the corresponding parameter. |
| **Object** | **Object 104: Mode – Mode status: 0=Cool; 1=Heat** |
| Function | 1 bit communication object to notify the machine mode between cooling and heating. |
| Description | By means of this communication object, the operating mode of the climate machine is red and notified between the cooling and heating modes. This communication object will only be available in the case that two unique modes are chosen in the corresponding parameter. |
| **Object** | **Object 105: Fan - Fan: 0-33%=Min; 34-67%=Med; >68%=High** |
| Function | 1 byte communication object to set the speed of the machine. |
| Description | By means of this communication object it is possible to set the fan speed of the machine. This communication object will only be available if three levels of ventilation are selected using the corresponding parameter. |
| **Object** | **Object 106: Fan – Fan status: 0-33%=Min; 34-67%=Med; >68%=High** |
| Function | 1 byte communication object to read or notified the speed of the machine. |
| Description | By means of this communication object it is possible to read or notify the ventilation speed of the machine. This communication object will only be available if three levels of ventilation are selected using the corresponding parameter. |

## 3.4 Parameters

### 3.4.1 General

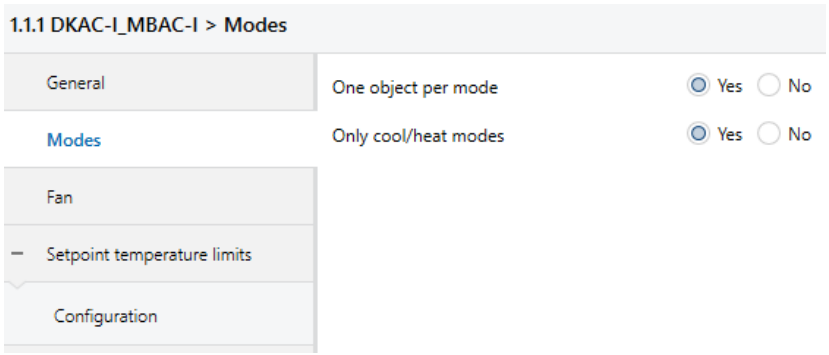



| | |
|---|---|
| **Parameter** | **Type of control** |
| Value | Slave / Master |

| | |
|---|---|
| Description | This parameter allows the use of the air conditioning gateway in master or slave mode, in case this last mode is supported. |
| **Parameter** | **Swing** |
| Value | Yes / No |
| Description | This parameter allows to enable the control options on the slats of the climate machine. A tab will appear in the left part of the window for that purpose. |
| **Parameter** | **Configuration after voltaje recovery** |
| Value | Yes / No |
| Description | This parameter allows to enable the options that allow the selection of the modes in the start of the gateway after recovering tension. A tab will appear in the left part of the window for that purpose. |
| **Parameter** | **Set point temperature limits** |
| Value | Enable / Disable |
| Description | If the measured temperature transmission parameter is set as cyclically or both, this additional parameter allows defining the period for sending notifications in seconds. |
| **Parameter** | **Temperature measured feedback** |
| Value | Yes / No |
| Description | Allows the enabling of notifications to the KNX bus or the reading of the temperature measured by the climate machine. By enabling this option, the time interval between notifications will be available for selection. |
| **Parameter** | **Window opening protection** |
| Value | Yes / No |
| Description | Enables the activation of the window opening protection that allows an energy saving of the installation. |
| **Parameter** | **Scenes** |
| Value | Yes / No |
| Description | This parameter allows you to configure or record scenes on the device. A new tab will be enabled in the left part of the window for that purpose. |
| **Parameter** | **Error handling** |
| Value | Yes / No |
| Description | This parameter allows to enable the communication objects by which the gateway notify the internal and/or external errors of the machine. |
| **Parameter** | **Advanced functions** |
| Value | Yes / No |
| Description | With this parameter the logical unit and timers of the gateway are enabled. |

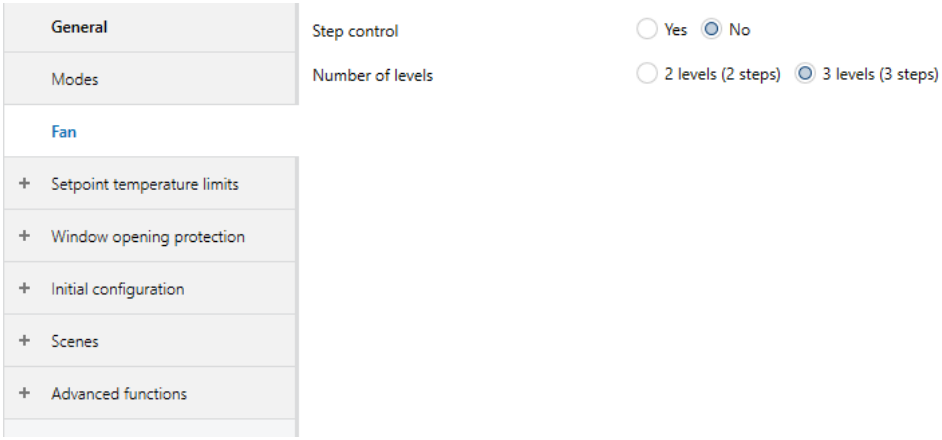
### 3.4.2 Modes

In the configuration tab of the operating modes, the following options are available:




| Parameter | One object per mode |
|---|---|
| Value | Yes / No |
| Description | It allows to have an independent communication object for each mode. New writing and notification communication objects will be enabled for this purpose. |
| **Parameter** | **Only cool/heat modes** |
| Value | Yes / No |
| Description | It allows to have only the heat and cold mode. |

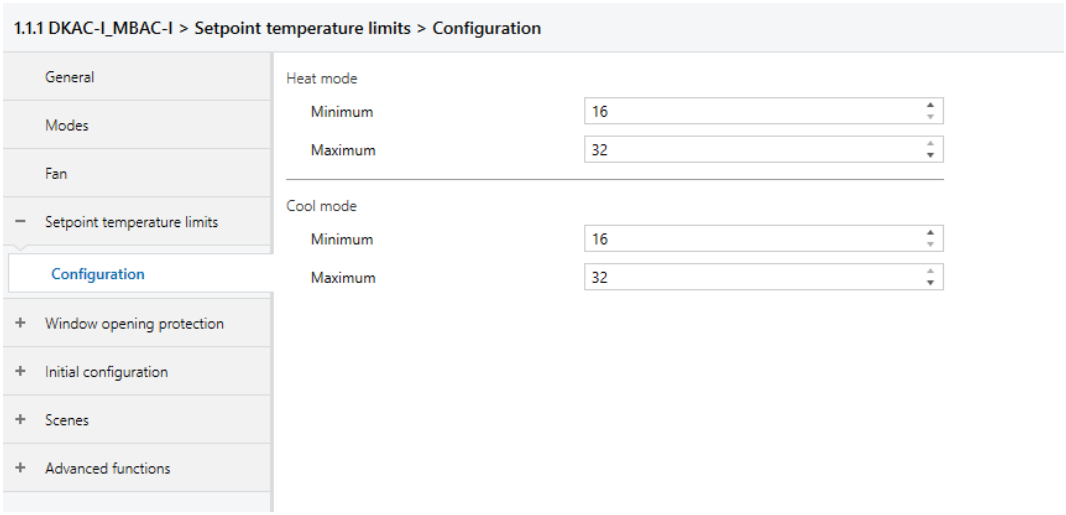
### 3.4.3 Fan




| Parameter | Step control |
|---|---|
| Value | Yes / No |
| Description | It allows to enable a communication object to increase or decrease the speed step by step. |
| **Parameter** | **Number of levels** |
| Value | 2 levels (2 steps) / 3 levels (3 steps) |
| Description | This parameter allows to select between two or three levels of ventilation speed. |

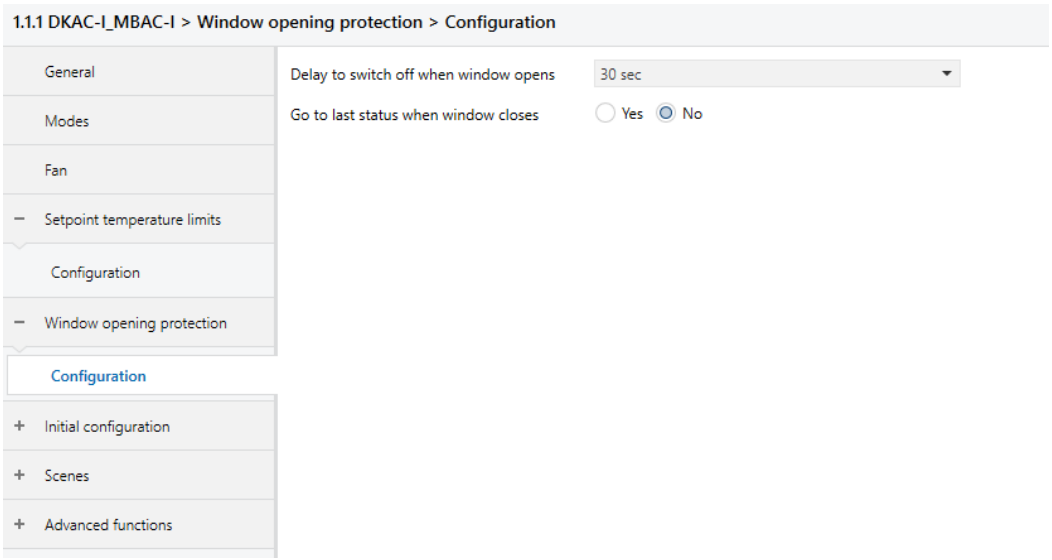
### 3.4.4 Setpoint temperatura limits

From this window it is possible to choose a maximum and minimum limit for setpoint temperatures. Each of the modes, cold and heat ones, will have a minimum and maximum value between which the setpoint temperature can be varied.

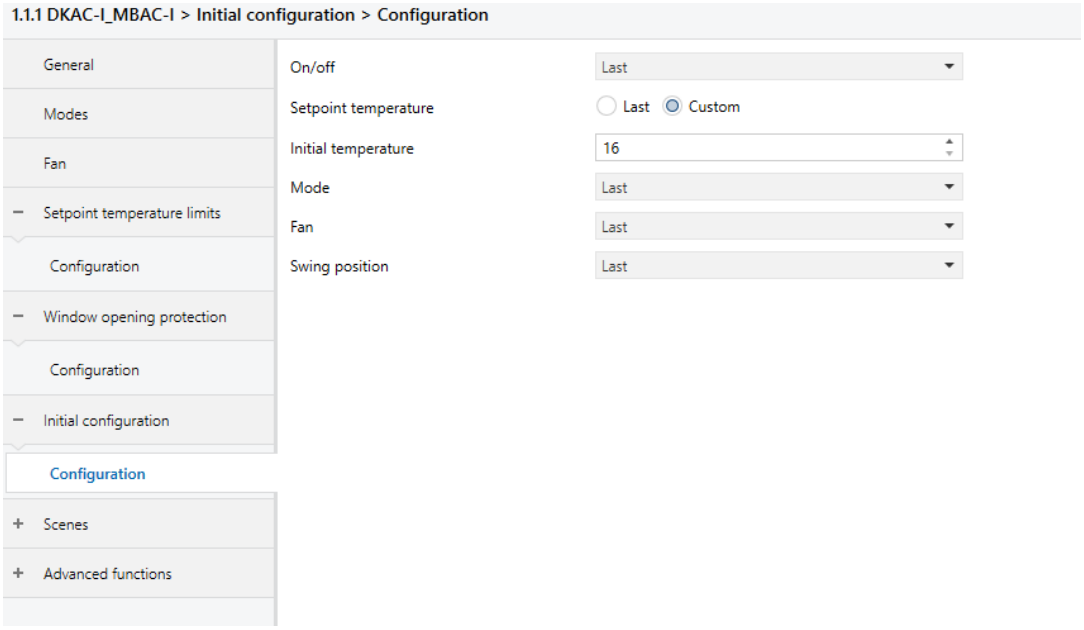



### 3.4.5 Window opening protection

The window opening protection allows the energy saving in the installation so that if a magnetic sensor is associated with the corresponding communication object, the machine will turn off automatically with the opening of the window. This will happen after a delay time or instantaneously, depending on what is selected in the parameter *Delay to switch off when window opens.* The machine will recover the previous state if the option is selected using *the Go to last status when window* closes.



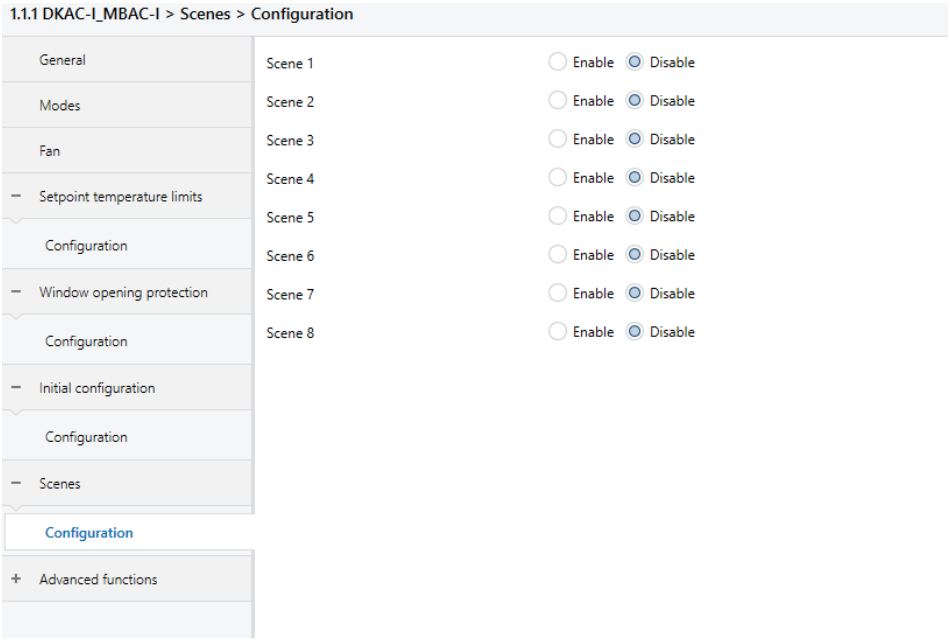
### 3.4.6 Initial configuration




| Parameter | On / off |
|---|---|
| Value | Last, ON, OFF |
| Description | Status to which the gateway will put the machine when giving power supply |
| **Parameter** | **Setpoint temperature** |
| Value | Last / Custom |
| Description | It allows to choose between an initial setpoint temperature defined in the *Initial temperature parameter* that is enabled with the *Custom* option. |
| **Parameter** | **Mode** |
| Value | Last, Auto, Heat, Dry, Heat, Cool |
| Description | It allows to choose the mode to which the machine will be placed after recovering power supply. |
| **Parameter** | **Fan** |
| Value | Last, minimum, maximum |
| Description | It allows to choose the fan speed between the minimum and maximum values |
| **Parameter** | **Swing position** |
| Value | Last, Position 1-5, Motion |
| Description | It allows to choose the position of the slats of the climate machine after recovering tension |

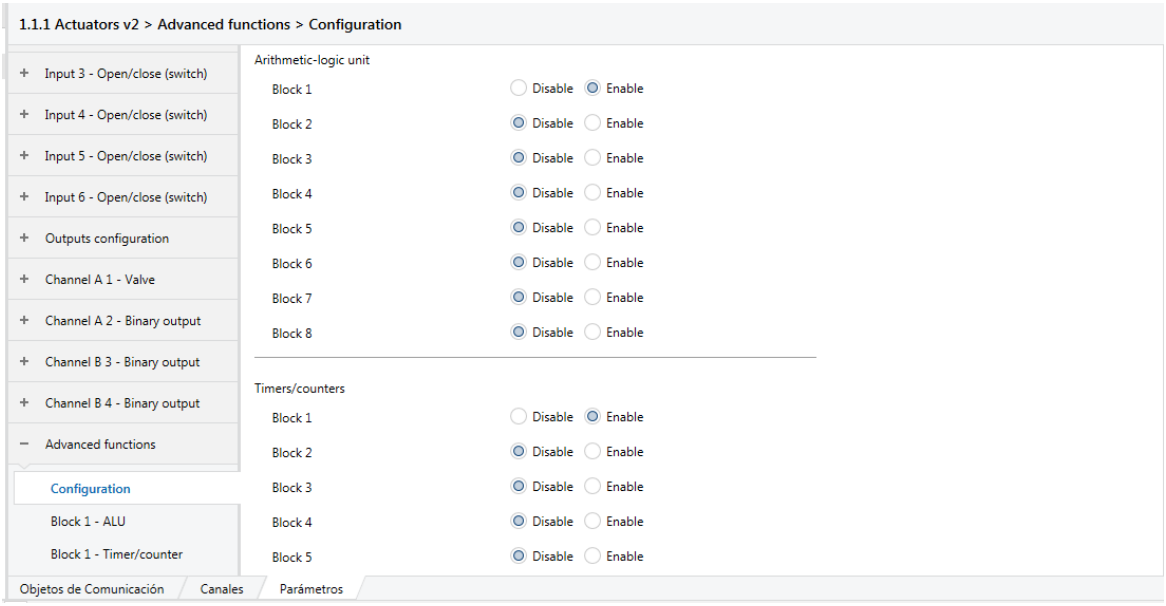
### 3.4.7 Scenes

The device allows to configure up to 8 scenes and the selection in them of the different parameters of the machine: modes, setpoint temperature, on / off, etc.




## 3.5 Advanced functions

If the advanced functions are enabled in the General menu, a new submenu appears on the left.

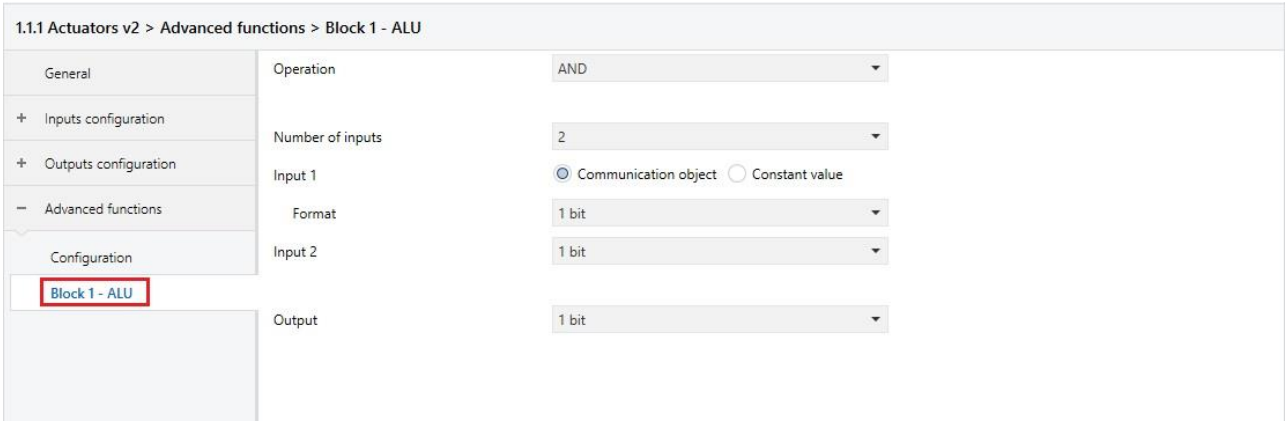



In this configuration menu it is possible to select what Arithmetic and logic or timers / counters blocks are enabled.

| Name | Arithmetic-logic block X |
|---|---|
| Values | Enable / Disable |

| | |
|---|---|
| Description | Allows to enable or disable each arithmetic and logic block. |
| **Name** | **Timer / counter block** |
| Values | Enable / Disable |
| Description | Allows to enable or disable the each timer / counter blocks. |

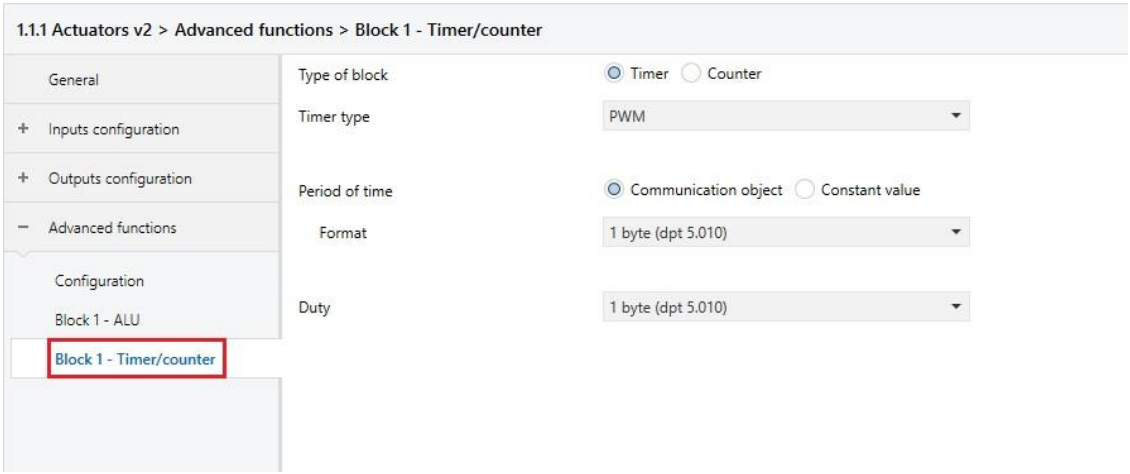
### 3.5.1 Arithmetic and Logic block (ALU)



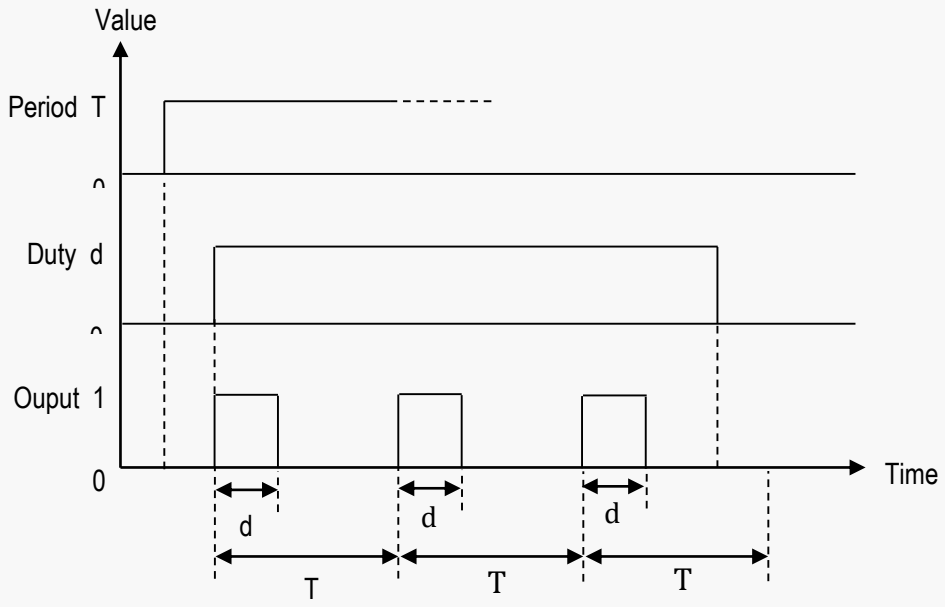

| **Name** | **Operation** |
|---|---|
| Values | AND, NAND, OR, NOR, XOR, XNOR, NOT, BUFFER, == , != , <, > , <= , >= , + , - , *, / . |
| Description | It allows to select the arithmetic or logic operation of the block:<br>Logic operations:<br>- AND: Logic product<br>- NAND: Negative logic product<br>- OR: Logic addition<br>- NOR: Negative logic addition<br>- XOR: Exclusive logic addition<br>- XNOR: Negative exclusive logic addition<br>- NOT: Negation<br>- BUFFER: Saves the input value in the output.<br>Comparison operation:<br>- == : equality<br>- != : inequality<br>- < : smaller than<br>- > : greater than<br>- <= : smaller or equal than<br>- >= : greater or equal than<br>Arithmetic operations:<br>- + : addition<br>- - : subtraction<br>- * : multiplication<br>/ : division |

| Name | Number of inputs |
|---|---|
| Values | From 2 to 4 |
| Description | This parameter defines the number of inputs of the block. Depending on the type of operation it is allowed two or more inputs. |
| **Name** | **Input 1** |
| Values | Communication object / Constant value |
| Description | This parameter allows to select the type of the input 1, that can be a constant value or a value received from a communication object. |
| **Name** | **Format** |
| Values | 1 bit, 1 byte unsigned (dpt 5.001), 1 byte unsigned (dpt 5.010), 1 byte signed (6.*), 2 bytes unsigned (dpt 7,*), 2 bytes unsigned (dpt 8,*), 2 bytes float (dpt 9,*). |
| Description | This parameter allows to select the size and format of the input 1. Depending on the type of operation different formats are allowed. |
| **Name** | **Input 2/3/4** |
| Values | 1 bit, 1 byte unsigned (dpt 5.001), 1 byte unsigned (dpt 5.010), 1 byte signed (6.*), 2 bytes unsigned (dpt 7,*), 2 bytes unsigned (dpt 8,*), 2 bytes float (dpt 9,*). |
| Description | This parameter allows to select the size and format of the other inputs communication objects. Depending on the type of operation different formats are allowed. |

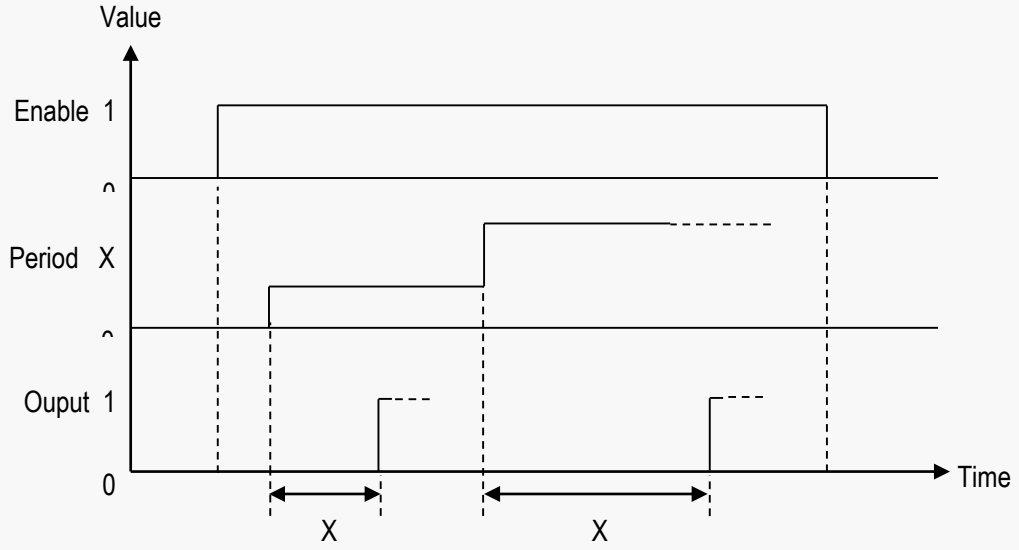
### 3.5.2 Timer / counter block



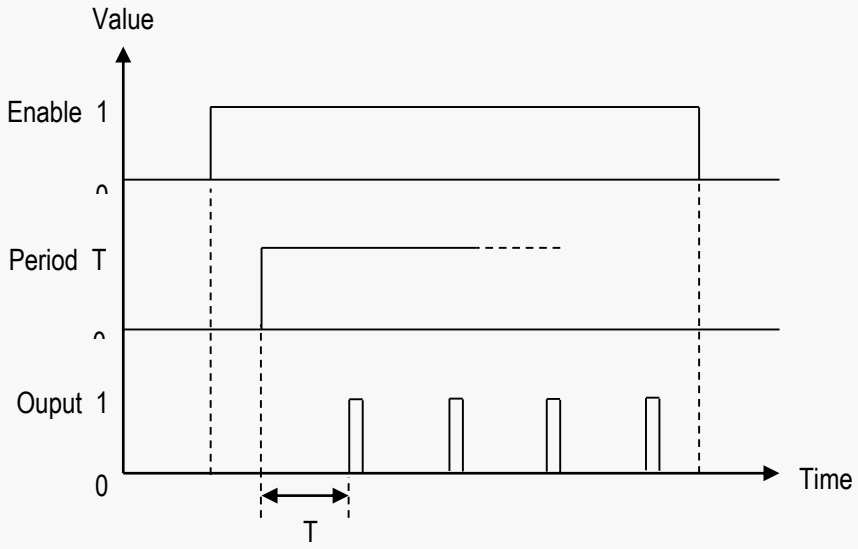

| Name | Timer type |
|---|---|
| Values | PWM, Limit, Cyclic |
| Description | PWM: It generates a pulse width modulated output according to the period of time and a duty. |




Limit: It sends a bit telegram '1' to the bus when a limit value is exceeded.

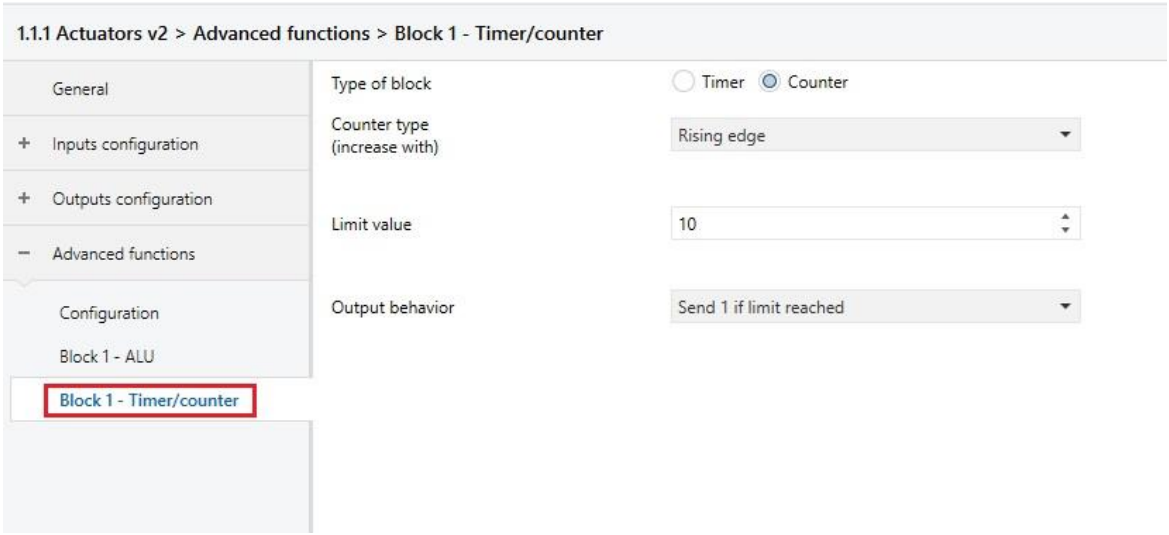


Cyclic: It sends a bit telegram '1' to the bus each time the limit value is exceeded cyclically.




| Name | Period of time |
|---|---|
| Values | Communication object / Constant value |
| Description | It is the count time of the timer. It can be configured as a constant value or a value received through the bus with one of the following communication object formats:<br><br>1 byte (dpt 5.010): Value from 0 to 255 (x 100 ms)<br>2 bytes (7.004): Value from 0 to 6553500 ms<br>2 bytes float (9.010): Value from 0 to 670760 s |

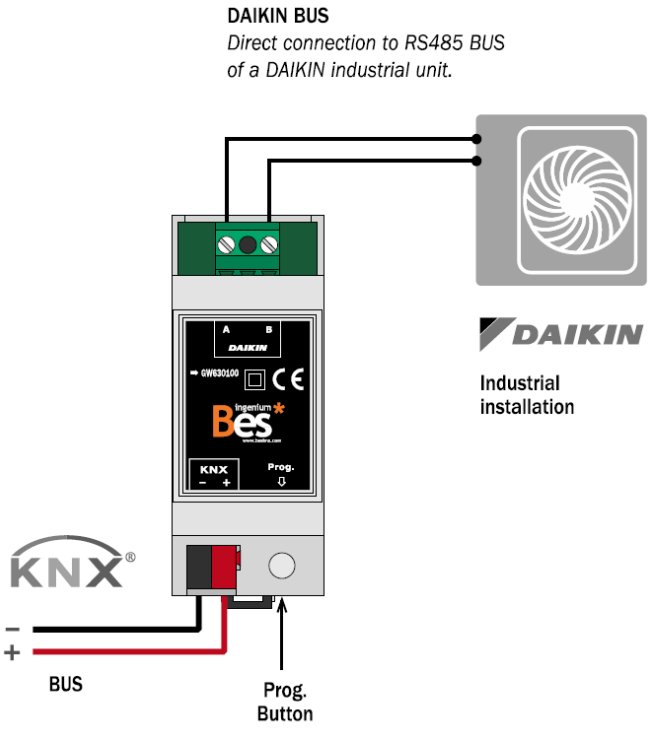
| Name | Duty |
|---|---|
| Values | 1 byte (dpt 5.010), 2 bytes (7.004) or 2 bytes float (9.010) |
| Description | Only visible if timer type PWM is selected. It is the time that the output signal is at high level ("1") within the period of time. Its value can be received through the bus with one of the following communication object formats:<br><br>1 byte (dpt 5.010): Value from 0 to 255 (x 100 ms)<br>2 bytes (7.004): Value from 0 to 6553500 ms<br>2 bytes float (9.010): Value from 0 to 670760 s |



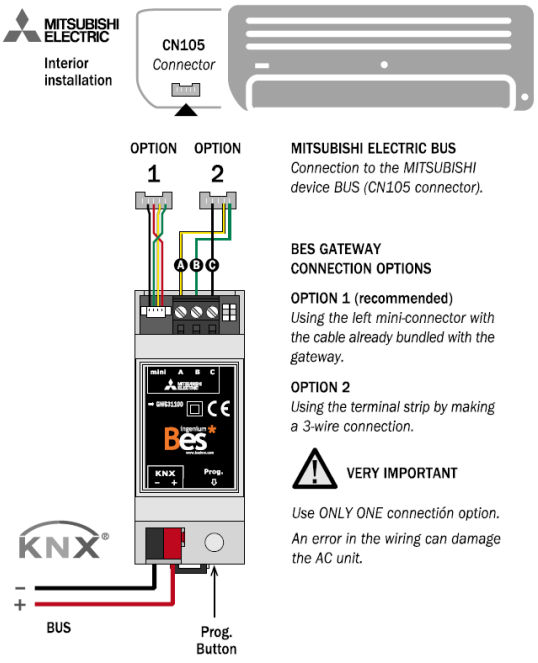

| Name | Counter type |
|---|---|
| Values | Rising edge, falling edge, 1 or 0 |
| Description | It is the change that the counter may detect in its “event” object to increase the count. |
| **Name** | **Limit value** |
| Values | From 0 to 65535 |
| Description | It is the number of events over which the counter sends the finish telegram. |
| **Name** | **Output behaviour** |
| Values | Send 1 when limit reached, Send counter value (5.010), Send counter value (7.001) |
| Description | This parameter allows to select the format and behaviour of the counter output. It can be send a 1 when the count limit is reached or it can send the count value each time an event is detected. |

# 4 Installation

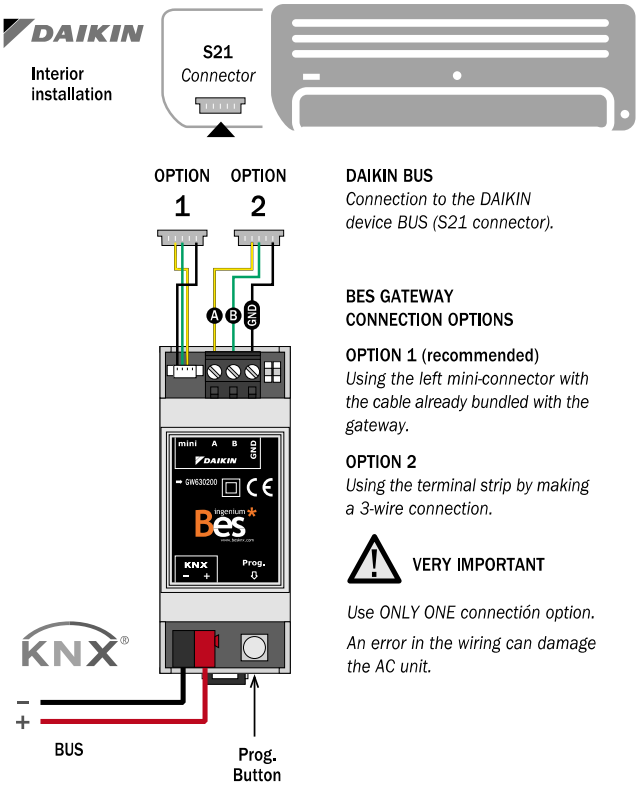
DKAC-I:



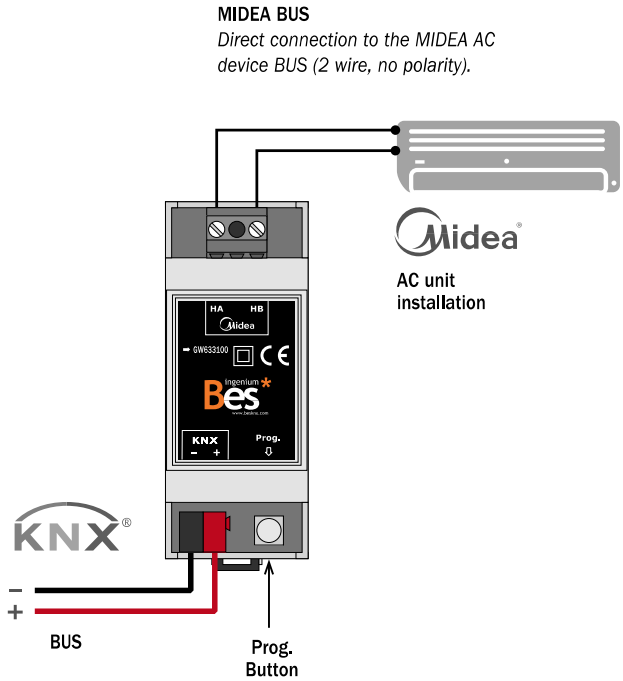

MBAC-I:



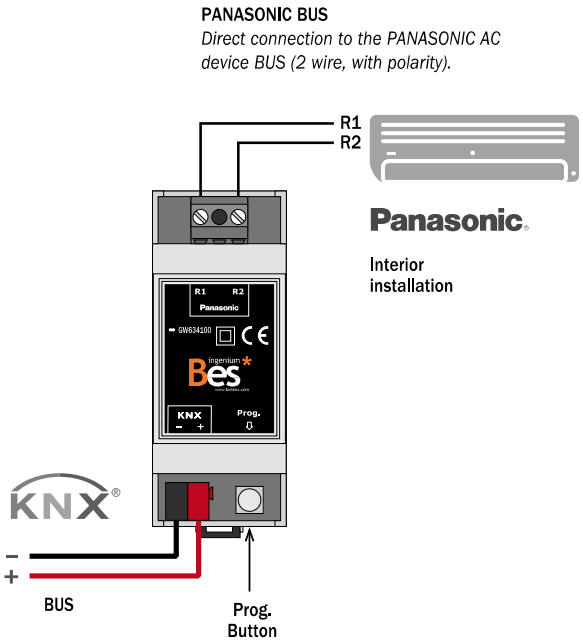
DKAC-D:


DAIKIN
Interior installation
S21
Connector
OPTION 1
OPTION 2
A
B
GND
mini A B GND
DAIKIN
GW630200
Bes
KNX
Prog.
KNX
BUS
Prog. Button
DAIKIN BUS
Connection to the DAIKIN device BUS (S21 connector).
BES GATEWAY CONNECTION OPTIONS
OPTION 1 (recommended)
Using the left mini-connector with the cable already bundled with the gateway.
OPTION 2
Using the terminal strip by making a 3-wire connection.
VERY IMPORTANT
Use ONLY ONE connectión option.
An error in the wiring can damage the AC unit.

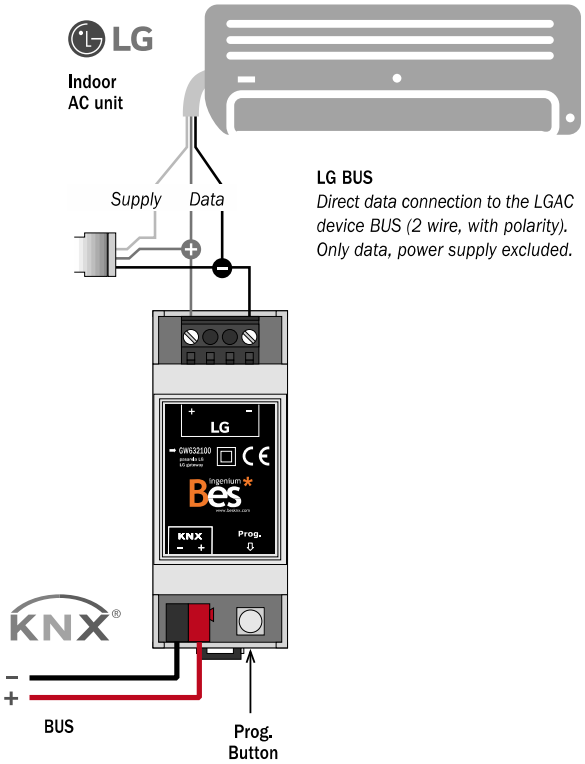
MDAC-K:


MIDEA BUS
Direct connection to the MIDEA AC device BUS (2 wire, no polarity).
Midea
AC unit installation
HA
HB
Midea
GW633100
Bes
KNX
Prog.
KNX
BUS
Prog. Button

PNAC-K:

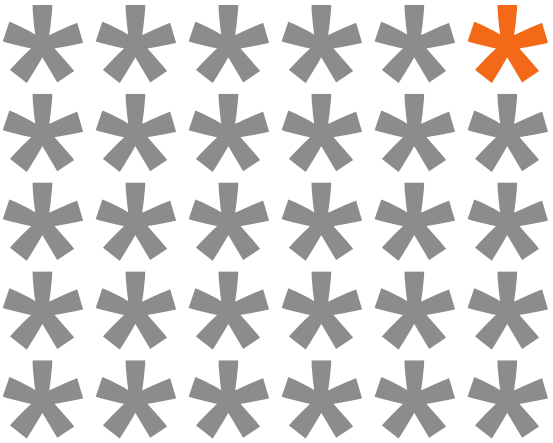

PANASONIC BUS
Direct connection to the PANASONIC AC device BUS (2 wire, with polarity).
R1
R2
Panasonic
Interior installation
KNX
–
+
BUS
Prog. Button

LGAC-D:


LG
Indoor AC unit
Supply
Data
LG BUS
Direct data connection to the LGAC device BUS (2 wire, with polarity). Only data, power supply excluded.
KNX
–
+
BUS
Prog. Button

*Feed the low voltage lines (bus and inputs) in separate conduits of the 230 V power supply in order to ensure that there is sufficient insulation and thus avoid interference.*

*Do not connect the 230 V mains voltage or any other external voltage to any point on the bus or to the inputs.*



KNX products by ingenium

ingenium Bes

www.besknx.com

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*Manual version: v1.0*